SELECTED PHYSICAL, SHELLING, AND GERMINATION PROPERTIES OF THE NEW SPANISH PEANUT VARIETIES 'SPANCROSS' AND 'TIFSPAN'

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Larry S. Creel, agricultural commodity grader at the National Peanut Research Laboratory, made most of the property measurements and assisted with the shelling tests. William G. Ferguson, engineering technician at the National Peanut Research Laboratory, conducted the dye-penetrant tests and determined the pod damage. Robert A. Tennille, engineering technician at the National Peanut Research Laboratory, was responsible for conducting the germination tests.

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SELECTED PHYSICAL, SHELLING, AND GERMINATION PROPERTIES OF THE NEW SPANISH PEANUT VARIETIES, 'SPANCROSS' AND 'TIFSPAN'

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SUMMARY

A study was conducted to determine some physical and shelling properties of 'Argentine', 'Spancross', and 'Tifspan' varieties of Spanish peanuts. The primary objective was to provide information that would be helpful in the commercial shelling of two new peanut varieties, 'Spancross' and 'Tifspan'. Peanuts of a common variety ('Argentine') were used as a standard for comparison. Secondary objectives were to provide basic information for designing new shelling equipment and for improving the performance of existing shelling equipment.

Some physical properties were approximately th same for all three varieties. These similar properties greatly simplified the comparisons for this study and minimized the differences between varieties in market value, outturns, rates of shelling, and shelling efficiencies.

Generally, 'Spancross' and 'Tifspan' had better shelling properties than 'Argentine' and no serious problems are expected in the commercial shelling of these peanuts.

Data obtained in this study and from earlier tests with 'Starr' and 'Argentine' peanuts indicate that many of the physical and shelling properties of 'Spancross' and 'Tifspan' peanuts are between those of the common varieties, 'Argentine' and 'Starr'. Thus, the information contained within this report together with shelling experience with 'Argentine' and 'Starr' peanuts should be very helpful to the industry in shelling 'Spancross' and 'Tifspan' peanuts.

Based on the physical and shelling properties of these three varieties, recommendations were made to improve the commercial precleaning, handling, and shelling of these peanuts.

INTRODUCTION

Very little information has been published (1, 6, 9, 12)[2] on the physical and shelling properties of peanuts. This type of information is needed to design new shelling equipment, improve the performance of existing shelling equipment and, shell peanuts of newly developed varieties.

In this study, some physical and shelling properties of two new Spanish varieties, 'Spancross' and 'Tifspan', were determined and compared to the properties of a common Spanish variety, 'Argentine'. This work was requested by the Georgia Cooperative Extension Service and the peanut industry. Information contained in this report supplements other research information reported for 'Spancross' (3) and 'Tifspan' (4) peanuts at their release in 1970.

PREPARATION FOR TEST

Peanuts of 'Argentine', 'Spancross', and 'Tifspan' varieties were grown during crop year 1971 at the Southwest Georgia Branch Station, Plains, Georgia, using the best known growing and harvesting practices. Agronomic data are presented in tables 1 and 2. The peanuts were left in the inverted windrow 2 to 4 days and good weather prevailed during the harvest season. Peanuts were picked (by combine) at 13 to 20 percent kernel moisture content and artificially dried to about 11 percent kernel moisture

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[2] Numbers in parentheses refer to items in "Literature cited" p. 11.

TABLE 1.—*Planting and harvesting data for 'Argentine', 'Spancross', and 'Tifspan' peanuts grown at Southwest Georgia Branch Station, Plains, Georgia, 1971*

Variety	Planting dates	Digging dates	Picking dates	Average kernel moisture at picking (% wet basis)
'Argentine'[1]	May 6	September 2 and 3	September 6 and 7	15.6
'Spancross'	May 5	September 6	September 8	18.2
'Tifspan'	May 7	September 7 and 10	September 9, 10, 13, and 14	18.1

[1] Light rain fell on Argentine peanuts while they were in the inverted windrows.

TABLE 2.—*Rainfall at the Southwest Georgia Branch Station, Plains, Georgia, during 1971 crop year*

Month	Rainfall (inches)	Month	Rainfall (inches)
January	3.76	June	6.91
February	7.26	July	12.21
March	8.39	August	3.58
April	4.21	September	1.87
May	4.38		

content using drying practices advocated by the Georgia Cooperative Extension Service. The peanuts were dried and stored by the Georgia Seed Development Commission at Plains, Georgia. Soil type, climatic conditions, cultural practices, herbicide and pesticide treatments, harvesting, drying and storage practices were the same for peanuts of all three varieties and no abnormal conditions were noted during the production history of these peanuts.

Digging dates were selected on the basis of visual observation of the vines, pegs and inside color of the hulls as well as the normal practical limitations. The maturity of the three varieties by this standard method appeared to be approximately equal. Arginine maturity indexes (AMI) were determined for these peanuts by Dr. Clyde T. Young of the Georgia Experiment Station, Experiment, Georgia. The average AMI values reported were 42.6, 39.7, and 50.0 for the 'Argentine', 'Spancross', and 'Tifspan' peanuts, respectively, indicating that the 'Argentine' and 'Spancross' peanuts were more mature than the 'Tifspan' peanuts.

After picking and drying, the peanuts were stored for about 6 months at Plains, Georgia, and then removed from storage and delivered to the National Peanut Research Laboratory at Dawson, Georgia. Peanuts of each variety were subjected to the study outlined in figure 1. The peanuts were cleaned with a commercial-type precleaner and the shelling properties were determined with a ¼-size commercial-type sheller. Physical properties of the pod, hull, and seed were determined by using standard laboratory equipment, such as micrometers, electronic counter, unit containers, and Federal-State Inspection Service equipment. Germination equipment and procedures were as recommended by the Georgia State Seed Testing Laboratory.

DATA AND RESULTS

Farmers Stock Value

The official grades and market value per ton (13) were approximately the same for farmers stock peanuts of all three varieties (table 3). The 'Argentine' peanuts had about twice as much foreign material as the newer varieties, but this variation probably resulted from differences in combine separating efficiencies and not from varietal differences.

Since the AMI data supplied by Dr. Clyde Young indicated that these 'Tifspan' peanuts (CY 1971) were relatively immature, official grade data for crop year 1972 were reviewed to see if 'Tifspan' peanuts would grade better if allowed to mature. The average grades of sound mature kernels[3] (SMK) plus sound split kernels for peanuts grown at the Southwest Georgia Branch Station during CY 1972 were 66.7, 67.3, and 64.7 for the 'Argentine', 'Spancross', and 'Tifspan', respectively, indicating that 'Tifspan' may produce a lower percentage of kernels retained on the 15/64-inch screen than the 'Argentine' and 'Spancross' peanuts.

[3] "Kernel" is standard Federal-State Inspection Service terminology for the peanut seed.

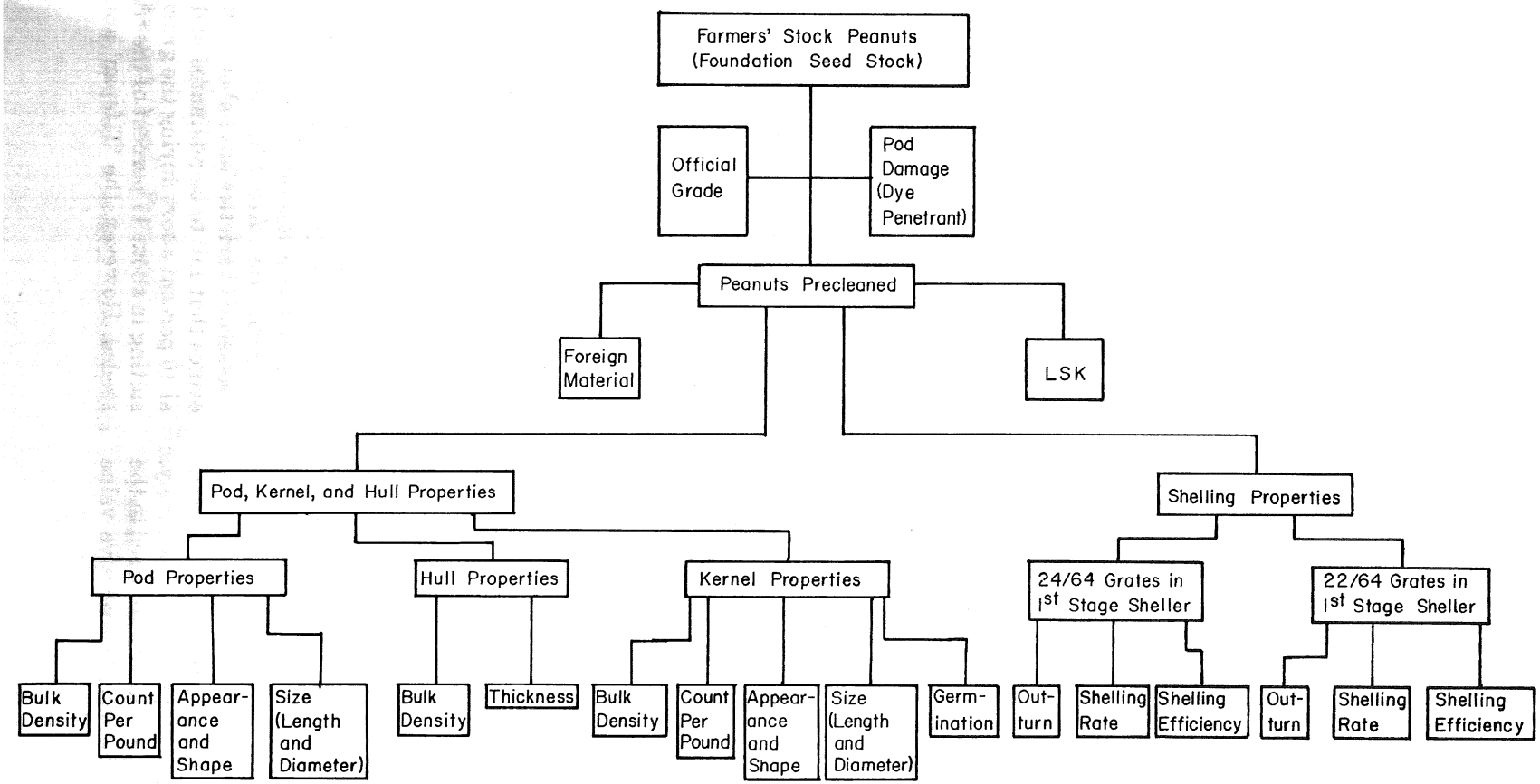

FIGURE 1.—General outline of studies conducted with 'Spancross', 'Tifspan', and 'Argentine' peanuts.

TABLE 3.—*Grades and market value of 'Argentine', 'Spancross', and 'Tifspan' peanuts*

Grade criteria	Grade or market value (percent)		
	'Argentine'	'Spancross'	'Tifspan'
Sound mature kernels (SMK)	62	63	63
Sound split kernels	6	6	5
SMK plus sound split kernels	68	69	68
Other kernels	8	7	8
Total damage (including damaged split kernels)	1	0	1
Total kernels	77	76	77
Total hulls	23	23	23
Total kernels and hulls	100	99	100
Foreign material	10	4	5
Loose shelled kernels	1	2	1
Kernel moisture	7.2	7.1	7.3
Market value per ton of net farmers stock	281.67	284.27	282.27

Precleaning

Precleaning removed most of the foreign material and some of the loose shelled kernels (LSK) from peanuts of all three varieties (table 4). The material removed with the LSK by the precleaner from the 'Spancross' and 'Tifspan' peanuts generally contained more whole kernels and small pods (nubbins) than did the material removed with the LSK from the 'Argentine' peanuts—probably because of the smaller pod- and kernel-size distributions of the two new varieties. The amount of dirt removed from the two new varieties was greater than from the 'Argentine' peanuts, probably because the 'Argentine' peanuts were in the windrow longer than 'Spancross' or 'Tifspan'. Observations at the South-Georgia Branch Station indicate that 'Spancross' tends to retain less dirt than 'Argentine' or 'Tifspan'.

Pod and Hull Properties

Sound broken pods were determined by the dye stains on the inside of the hulls and kernels after the pods had been immersed in dye solution, dried, and hand shelled. Percentages of cracked or broken pods were 35.3 and 38.7 for the 'Argentine', 'Spancross' and 'Tifspan' peanuts, respectively. Similar data for 'Early Runner' and 'Florunner' peanuts were 35.3 and 38.7 percent, respectively. Some pod damage undoubtedly occurred in the mechanical picking (5, 10, 11). However, the relative value and extent of pod damage for all varieties were less than that normally found in mechanically-picked peanuts and indicated that good harvesting practices had been used. Pod damage was usually restricted to the apical end of the pod. The higher values of pod damage and higher shelling rates shown by the two new varieties probably resulted from their characteristic thin hull and pod shape. The differences in hull damage between 'Argentine' and these new varieties would be greater than reported here, if the data were adjusted for the effects on hull damage reported by the literature (5, 10, 11) of kernel moisture content at picking and time in the windrow see table 1.

A representative sample of each variety was divided into five pod-shape categories as shown in figure 2. 'Tifspan' and 'Spancross' pods had similar shapes except that 'Spancross' peanuts had slightly more tapered pods (table 5). 'Tifspan' and 'Spancross' pods had fewer normal, tapered and one-seeded pods, but more constricted and odd-shaped pods than 'Argentine' peanuts. The maximum intercalary shell depression between the two seed cavities averaged about 0.038 inches for the constricted pods of all three varieties. According to the literature (7), two-seeded varieties have about 7 percent of the ovules that fail to be pollinated and an additional 10 percent abort during the growth period resulting in about 17 percent of the fruit being one seeded. However, the 'Tifspan' and 'Spancross'

TABLE 4.—*Composition of materials removed during precleaning of peanuts, in percent of net Farmers' Stock*

Variety	Foreign materials removed by cleaner					Estimate of LSK prior to cleaning (official grade)
	Sticks	Light trash	Dirt	Rocks	Total	
'Argentine'	4.1	1.1	0.3	4.8	10.3	1
'Spancross'	1.8	1.2	0.5	0.8	4.3	2
'Tifspan'	1.5	0.8	0.8	1.6	4.7	1

	LSK removed by cleaner (red tag)	Estimate of foreign material prior to cleaning (official grade)	Small whole kernels in red tag LSK	Nubbins in red tag LSK
'Argentine'	0.4	10	0.081	0.014
'Spancross'	0.3	4	0.109	0.022
'Tifspan'	0.3	5	0.122	0.010

peanuts were more efficient in producing two-seeded pods and had only half as many one-seeded pods as the 'Argentine' peanuts. Generally, one-seeded pods and tapered pods are more difficult to damage or shell. A relatively low percentage of one-seeded and tapered pods plus the relatively thin hulls of the 'Spancross' and 'Tifspan' peanuts probably accounted for their high (compared to 'Argentine') pod damage and shelling rates.

'Spancross' and 'Tifspan' peanuts had smaller diameters but longer pods than 'Argentine'. Previous research has shown that shelling efficiencies for a particular grate size are directly proportional to pod diameter, and thus for the same grate size the shelling efficiencies for 'Spancross' and 'Tifspan' peanuts were expected to be lower than for 'Argentine' peanuts. The pod size data appeared to best fit a normal distribution (fig. 3). Peanuts of the three varieties had about the same pod count per pound, pod bulk density, and hull bulk density. Hulls of the 'Spancross' and 'Tifspan' peanuts were slightly thinner than the hulls of 'Argentine' peanuts. Thinner hull varieties are generally more susceptible to mechanical damage, and have higher kernel outturns and higher shelling rates than thicker hull varieties (6).

Kernel (Seed) Properties

General kernel shape was approximately the same for all three varieties. The average difference between the width and thickness of the kernels was approximately 2/64-inch, being slightly greater for the large kernels and slightly less for the small kernels (table 6).

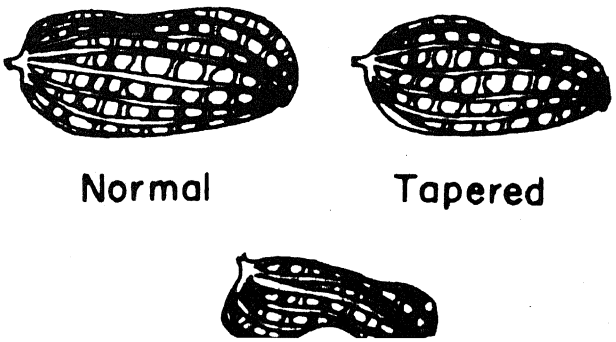

TABLE 5.—*Some physical properties of the pods and hulls of 'Argentine', 'Spancross', and 'Tifspan' peanuts*

Variety	Pod property						
	Shape (% by wt)					Length[1]	
	Normal	Tapered	Constricted	One-seeded	Odd-shaped	Average	Range
'Argentine'	63.5	11.6	2.7	13.0	2.4	0.832	0.593-0.079
'Spancross'	70.3	10.6	15.3	6.0	5.5	.842	.547-1.131
'Tifspan'	62.7	6.9	16.6	7.9	5.0	.872	.644-1.206

Variety	Pod property (continued)				Hull property		
	Width[2]			Bulk density	Thickness (in.)		Bulk density
	Average	Range	Count/lb	(lb/ft³)	Average	Range	(lb/ft³)[3]
'Tifspan'	0.444	0.310-0.599	576	19.6	0.035	0.014-0.062	5.0
'Spancross'	.438	.270- .593	580	20.5	.030	.009- .060	5.0
'Argentine'	.428	.274- .570	561	19.1	.034	.018- .056	5.1

[1] Does not include one-seeded or odd-shaped pods.
[2] Does not include odd-shaped pods.
[3] Does not include one-seeded pods.

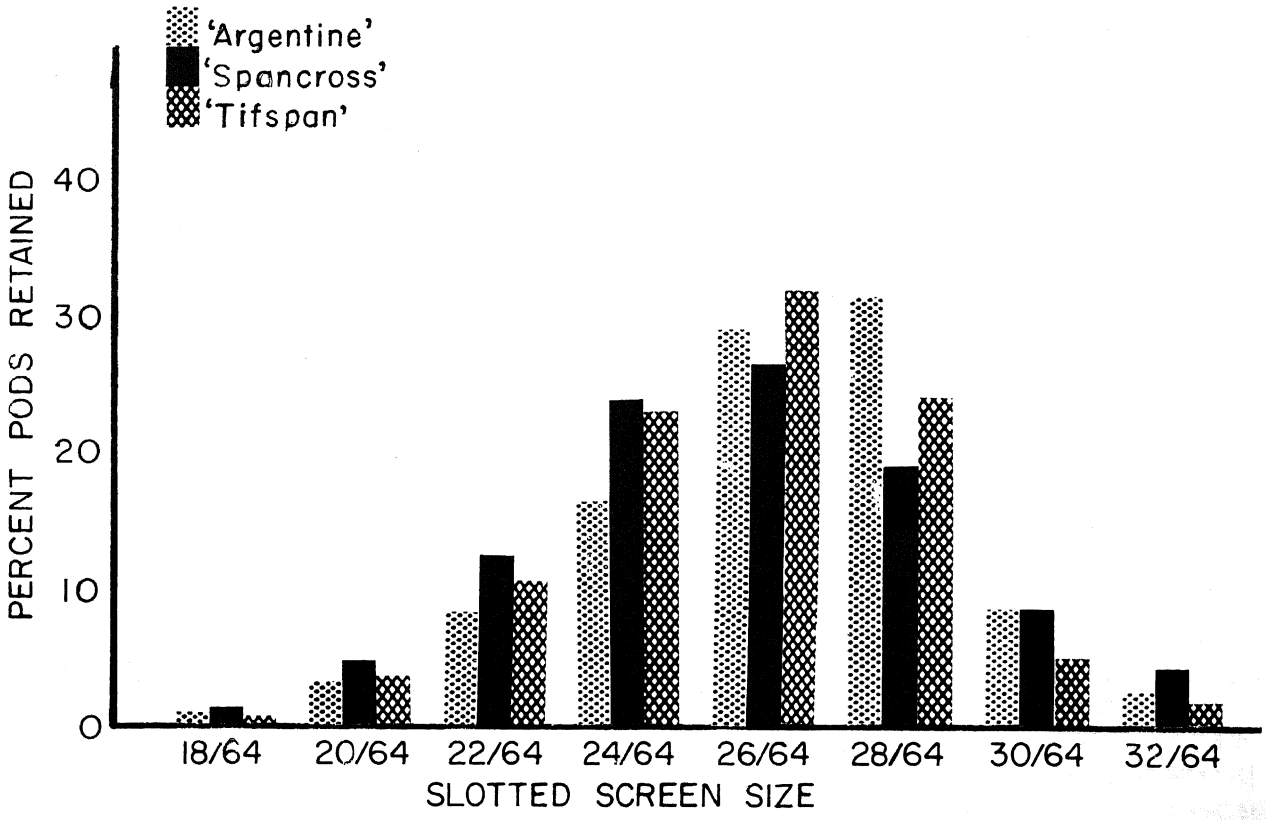

FIGURE 3.—Pod size distribution of 'Argentine', 'Spancross', and 'Tifspan' peanuts in 1971 (pods retained on one screen, but falling through the next larger size.)

TABLE 6.—*Some physical properties of 'Argentine', 'Spancross', and 'Tifspan' kernels*

Variety	Length (inches)		Width (inches)		Thickness (inches)	
	Average	Range	Average	Range	Average	Range
'Argentine'	0.403	0.199-0.626	0.308	0.147-0.498	0.269	0.108-0.358
'Spancross'	.409	.192- .633	.306	.136- .450	.267	.069- .395
'Tifspan'	.412	.201- .720	.294	.136- .421	.260	.078- .357

	Count/lb.				
	Total	Retained on 15/64 in. slotted screen	Bulk density (lb./ft.[3])	Appearance	Color[1] raw skin
'Argentine'	1397	1273	42.33	Excellent	Darkest
'Spancross'	1433	1270	42.42	Excellent	Lightest
'Tifspan'	1362	1227	42.94	Excellent	Intermediate

[1] Color evaluations made by Jack L. Pearson, research horticulturist, National Peanut Research Laboratory.

The kernel size data showed an approximately normal distribution, similar to that obtained for the pods (fig. 4). The kernels of 'Spancross' and 'Tifspan' had smaller diameters but were longer than the kernels of 'Argentine' peanuts. 'Tifspan' had the longest and smallest diameter kernels, a slightly lower kernel count per pound, and slightly higher kernel bulk density than 'Span-

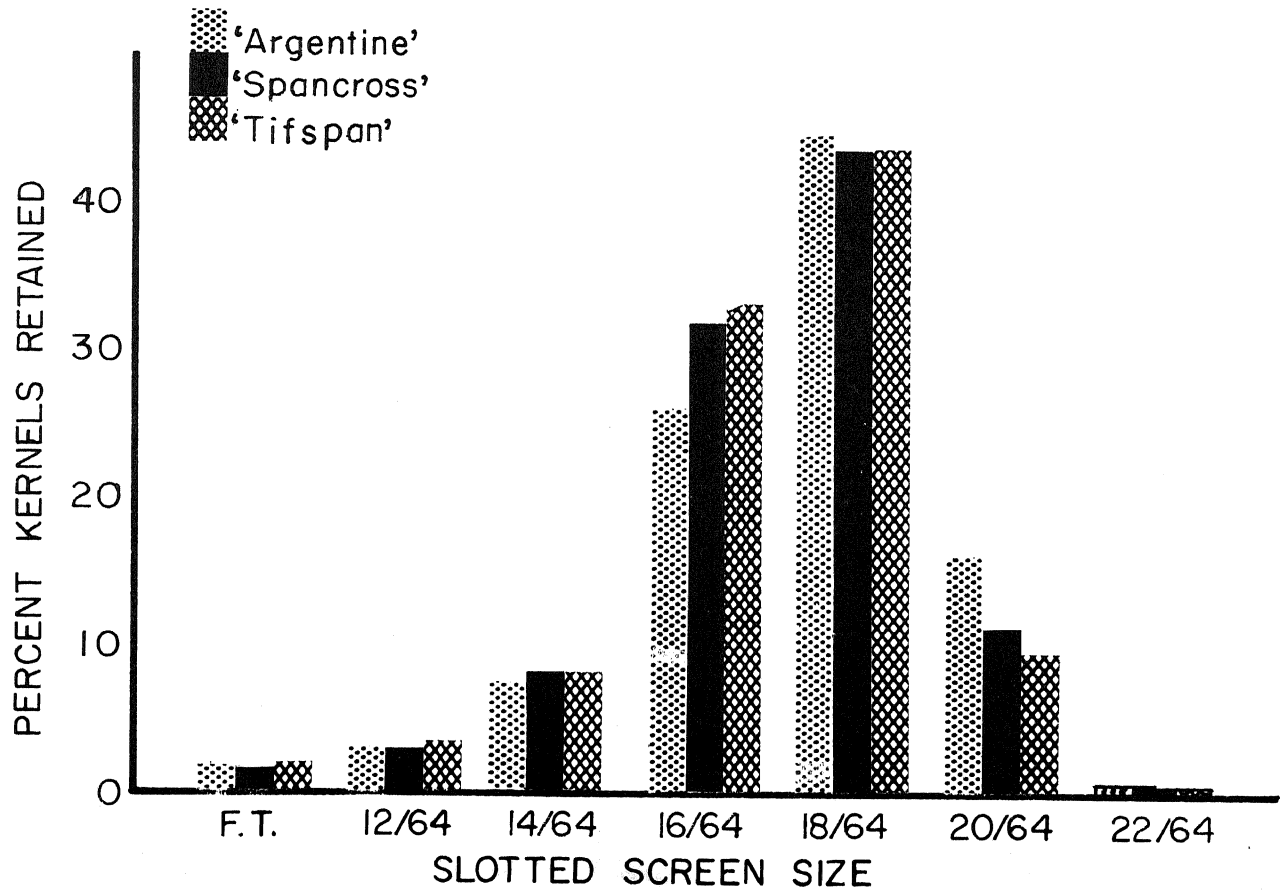

FIGURE 4.—Kernel size distribution of 'Argentine', 'Spancross', and 'Tifspan' peanuts in crop year 1971 (kernels retained on one screen, but falling through next larger size)

cross' and 'Argentine'. Because of their smaller average kernel size, the new varieties would tend to have a lower SMK and a higher percentage of kernels near the 15/64-inch screen size than 'Argentine'. The effects of such variables as harvest dates, and shrinkage, on percent of kernels (SMK) retained on this screen will be slightly greater for the new varieties than for 'Argentine'. However, the average kernel sizes of the new varieties are larger than 'Starr' (another common variety) and the SMK and the effects of such variables on SMK for the new varieties should be between that experienced for 'Argentine' and 'Starr'.

Kernels of all three varieties had a very satisfactory appearance. 'Spancross' had a significantly lighter skin color than 'Argentine' and 'Tifspan' kernels. Differences in raw skin color may have resulted from slight differences in windrow exposure. In replicated (2 replications) comparisons of these varieties, Pearson (8) found none significantly lighter or darker than the others in the 1968 or 1969 crops.

Germination percentages were high for all three varieties of peanuts (table 7). However, germination percentages were higher for 'Spancross' and 'Tifspan', and appeared to be less sensitive to machine shelling and grate-size selection than 'Argentine' peanuts.

Shelling Data

Generally, 'Spancross' and 'Tifspan' had better shelling properties than 'Argentine' peanuts (table 8). 'Spancross' peanuts had the highest meat (total seed) outturn and the highest market value; 'Tifspan' had the lowest meat outturn and the lowest market value. The shelled peanuts were sized and graded (2) to meet the latest marketing standards. Split kernel, bald kernel and oil stock outturns were lower for 'Tifspan' and 'Spancross' than for 'Argentine' pea nuts. Shelling outturns of kernels tendered t Commodity Credit Corporation were approx mately the same for all three varieties. Bes grate size selection (of those studied) for a three varieties for obtaining maximum who kernel outturn was 24/64-, 22/64-, and 20.5/6 inch in the first, second, and third stages of shel ing, respectively. 'Argentine' shelling outturn were affected more by small grate sizes tha those of the two new varieties. The 'Argentin kernels were larger in diameter and did not pas through the grate openings as easily as kerne of 'Spancross' and 'Tifspan'.

Shelling rates for 'Spancross' and 'Tifspa were 13 to 15 percent higher than for 'Arge tine' peanuts, probably resulting from the characteristic pod shape (the low percentages one-seeded pods and tapered pods) and thi hulls. Shelling rate was relatively independe of grate size for all three varieties.

Shelling efficiencies were lower for 'Spa cross' and 'Tifspan' than for the 'Argentine' pea nuts primarily because the pods of the 'Spa cross' and 'Tifspan' peanuts were smaller in d ameter and passed more easily through the gra openings.

A screen with 22/64-inch wide by 5/8-inc long slots was the most effective of all scree (slot) sizes tested for separating shelled and u shelled peanuts that pass from the first sta sheller (table 9). This size screen was more e fective for the two new varieties than for 'A gentine' and if not overloaded or clogged, w allow very few (less than 0.1 percent) of th kernels to pass into the second stage sheller. A though the pods and kernels of 'Spancross' a 'Tifspan' were smaller than 'Argentine' pods a kernels, the differences in size were not enou to warrant the use of different screen and gra sizes for each variety.

TABLE 7.—*Germination percentages of 'Argentine', 'Spancross', and 'Tifspan' seed*

Type of shelling	Sheller grate sizes[1]			Germination (percent)		
	Stage 1	Stage 2	Stage 3	'Argentine'	'Spancross'	'Tifspan'
Hand	---	---	---	91.6	98.2	93.4
Machine	24	22	20.5	84.4	93.3	90.6
Machine	22	20.5	19	82.2	93.8	92.0

[1] Grate sizes expressed in sixty-fourths of an inch.

TABLE 8.—*Shelling data for 'Argentine', 'Spancross', and 'Tifspan' peanuts*

Variety and grate combination[1]	Composition of peanut kernels in percent					
	Kernel moisture at shelling	U.S. No. 1 kernels	Splits	CCC large kernels	CCC small kernels	Oil stock
'Argentine'	6.8					2.7
A	6.8	53.1	9.1	3.5	1.5	
B		49.5	12.6	3.5	1.5	3.8
'Spancross'	6.8					4.2
A	6.8	56.6	8.1	3.6	1.5	
B		56.3	8.9	3.6	1.5	2.7
'Tifspan'	6.8					2.8
A	6.8	57.1	6.4	3.5	1.5	
B		55.4	8.3	3.5	1.5	2.6

Variety and grate combination[1]	Composition of peanut kernels in percent (continued)				
	Bald kernels	Total meat outturn	Shelled value/T farmers' stock ($)	1st stage sheller efficiency (%)	1st stage shelling rate (lb/hr)
'Argentine'					
A	3.2	74.5	297.91	91.3	1510
B	3.6	74.5	297.91	96.5	1550
'Spancross'					
A	2.0	74.8	303.17	86.6	1740
B	2.0	74.8	303.17	93.9	1780
'Tifspan'					
A	1.9	73.2	296.84	83.8	1730
B	2.0	73.2	296.84	93.8	1720

[1] Grate combination A was 24/64-, 22/64-, and 20.5/64-inch in 1st, 2nd, and 3rd stages of shelling. Combination B was 22/64-, 20.5/64-, and 19/64-inch in the 1st, 2nd, and 3rd stages.

TABLE 9.—*Separation of shelled from unshelled peanuts after first stage sheller*

Variety	Grate combination[2]	% retained on screens[1]						
		Shelled			Unshelled			
		22/64	20/64	18/64	24/64	22/64	20/64	18/64
'Argentine'	A	0.09	8.89	31.93				
	B	.06	7.06	31.36				
'Spancross'	A	.09	8.04	34.41				
	B	.00	8.03	34.37				
'Tifspan'	A	.07	7.61	35.23				
	B	.00	5.81	32.55				

[1] Calculated on net farmers' stock.

[2] Grate combination A: 24/64-, 22/64-, and 20.5/64-inch in the 1st, 2nd, B: 22/64-, 20.5/64-, and 19/64-inch in 1st, 2nd, and 3rd stages.

CONCLUSIONS

Generally, the physical and shelling properties of 'Spancross' and 'Tifspan' were similar (including germination), and often superior to those of 'Argentine' peanuts. Thus, no serious problems are expected in commercial shelling of these peanuts the farmers s the same for value per ton 'Spancross' pe span' peanuts to total meat

The following properties were approximately the same for all three varieties: (1) Bulk density of farmers stock, (2) bulk density of hulls, (3) bulk density of kernels (seeds), (4) count per pound of pods (two-seeded pods), (5) count per pound of kernels, (6) variation in kernel shape, and (7) percent of kernels tendered to CCC.

'Spancross' and 'Tifspan' had fewer one-seeded and tapered pods, and thinner hulls than the 'Argentine' peanuts. Apparently, these pod shapes and hull characteristics make the 'Spancross' and 'Tifspan' pods more susceptible than 'Argentine' pods to mechanical damage. Although these characteristics result in high shelling rates and high meat outturns, they are often considered undesirable because they make the peanuts more susceptible to damage by mold and insects.

Pod and kernel size distributions were approximately normal for all three varieties, but the average pods and kernels of 'Spancross' and 'Tifspan' were smaller in diameter and longer than those of 'Argentine' peanuts. The differences in pod diameters among the varieties resulted in differences in shelling efficiencies, the varieties with the smaller pod diameters ('Spancross' and 'Tifspan') having the lower shelling efficiencies. The differences in kernel diameters between the varieties appeared to result in differences in the effects of grate size selection on whole kernel outturns—grate size selection being less critical for the small-seeded varieties, 'Spancross' and 'Tifspan.'

The slightly thinner hull of the new varieties would tend to produce slightly higher total kernel (meat) and SMK outturns than for the thicker-hulled 'Argentine' variety. However, an increase in SMK resulting from the thinner hulls of the new varieties would be offset by their smaller kernel size distribution. Since 'Tifspan' has the smallest average kernel size of the three varieties it will probably also have the lowest percentage of kernels retained on the 15/64-inch slotted screen.

The skins (testa) and cotyledons of 'Spancross' and 'Tifspan' were more cohesive than the skins and cotyledons of 'Argentine' and their kernels were less susceptible to skinning and splitting than the kernels of 'Argentine' peanuts. Although some of the difference in cohesiveness of the skins and kernels may be attributed to slight variations in length of exposure in the windrow and differences in kernel moisture content at picking time, most of the differences in milling quality reported here are probably genetic.

Although there were differences in properties of the three varieties, the differences noted were not enough to warrant the use of different grate and screen sizes. Grates and screens used for shelling 'Argentine' should be adequate for shelling 'Spancross' and 'Tifspan' peanuts. For all of these peanuts the best grate size combination of those studied was 24/64-, 22/64-, and 20.5/64-inch in the first, second, and third stages of shelling, respectively. The best slotted hole screen size for scalping off the large unshelled peanuts and passing the shelled peanuts was a 22/64-inch wide by 5/8-inch long slotted hole screen.

RECOMMENDATIONS

Physical and shelling properties of these peanuts will vary from lot to lot because of differences in soil, climate, cultural practices, etc., but these data should be fairly representative for 'Argentine', 'Spancross', and 'Tifspan' peanuts when recommended practices are used and no abnormal crop conditions are encountered.

Most of the physical and shelling properties of 'Tifspan' and 'Spancross' were similar and prior research on 'Argentine' and 'Starr' peanuts indicate that many of the physical and shelling properties of 'Tifspan' and 'Spancross' peanuts are intermediate between those of 'Starr' and 'Argentine' peanuts. Thus, the knowledge obtained by industry through past experience in shelling 'Argentine' and 'Starr' peanuts (common varieties) and the information contained herein should be very helpful in the commercial shelling of these peanuts.

Based on this study the following additional recommendations are offered for improving the precleaning, handling and shelling of these peanuts:

(1) Use sand screens or similar machines to remove dirt from the farmers stock peanuts prior to shelling to minimize the loss of sound split kernels to oil stock as a result of "dirty face splits." Such machines are warranted for shelling varieties whose pods have high dirt-retaining ability.

(2) Use machines to remove nubbins and whole kernels from the LSK (red tag), especial-

ly for peanut varieties that have relatively small pod and kernel size distributions.

(3) Use gentle handling practices and equipment to offset the relatively high susceptibility of 'Spancross' and 'Tifspan' peanuts to mechanical damage.

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